III. REMARKS

A. Prior Office Actions Basis

Claims 1-24 are pending in the present Application. The disclosure was objected to based upon informalities in the specification on: page 12, lines 30-31; page 13, lines 14-15; page 13, lines 21-22; page 14, lines 11-12; and page 22, line 33 to page 23, line 1. Claims 1-24 were rejected by the Examiner under 35 U.S.C. Sec. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The Examiner noted that Claims 2-6, 8-12, 15-19, 21, 23 and 24 each depend from the rejected independent Claims 1, 14 and 22.

B. Amendment Overview

By this Amendment, the Specification has been amended on: (1) page 12, lines 30-31 to delete the words "partially shown in Fig. 2 but mostly"; (2) page 13, lines 14-15 to replace "in Fig. 3" with - - in Fig. 4 - -; (3) page 13, line 19 to replace "... 65-degrees Fahrenheit in a first set of tubes" with - - ... 65-degrees Fahrenheit and serves as a first set of tubes - -; (4) page 13, line 20 to replace "... fluid 148 traveling in the first set of tubes is interfaced in the tubular coil arrangement 216 with the contaminated gas phase 206 traveling in a second set of tubes." with - - ... fluid 148 travels in the first set of tubes which is represented by the tubular coil arrangement 216 while the contaminated gas phase 206 travels in a second tube which is represented by the chiller dryer condenser 214 in Fig. 4. - -; (5) page 13, lines 22-23 to replace "The contaminated gas phase 206 traveling in the second set of tubes of the tubular coil arrangement 216" with - - The contaminated gas phase 206 traveling in the second tube ... - -; (6) page 14, lines 11-12 to replace "... contaminated gas phase 206 and atmospheric carrier air 218 pass through the tubular coil arrangement 216 of the chiller dryer condenser 214" with - - ... contaminated gas phase 206 and atmospheric carrier air 218 pass across the tubular coil arrangement 216 within the chiller dryer condenser 214 - -; (7) page 21, lines 2-3 to replace "... second centrifugal pump 340 to isolated the discharge side ..." with

- - second centrifugal pump 340 to isolate the discharge side - -; and (8) page 22, line 33 to page 23, line 1 to replace "... contaminated gas phase 206 enters the tubular coil arrangement 216 of the chiller dryer condenser 214 ..." with - - contaminated gas phase 206 passes across the tubular coil arrangement 216 within the chiller dryer condenser 214 - -. Dependent Claims 7and 20 have each been amended to overcome the Examiner's rejection based upon 35 U.S.C. Sec. 112, 2nd paragraph, as lacking a clear antecedent basis, and dependent Claim 13 has been amended to overcome the Examiner's position that Claim 13 is incomplete. The claims and specification have been amended in accordance with 37 C.F.R. Sec. 1.121 as revised on July 30, 2003 and the required claim listing is included herewith. Arguments in favor of allowance of Claims 1-24, as amended, are also included. Amendments and additions to the Claims have been drawn from the Specification and Drawings as originally filed. Amendments to the Specification have been drawn from the Drawing Figs. as originally filed. New matter as described in 35 U.S.C. §132 has not been added to the Specification. The proposed changes should not, therefore, be objectionable. Accordingly, entry of these changes is hereby respectfully requested.

C. Amendments to the Specification

Amendments to the Specification (as originally filed) in marked-up form ("replacement paragraph") are included with this Amendment "A".

1. The disclosure was objected to by the Examiner at several locations in the Specification (as originally filed). The Examiner has required appropriate correction.

2. The paragraph on page 12, line 30 to page 13, line 7 of the original specification has been replaced to delete the confusing language "partially shown in Fig. 2 but mostly" (on page 12, lines 30-31) to clarify the language. The "Replacement Paragraph" is recited in the enclosed Section entitled In The Specification appearing on page 2 of this Amendment "A".

3. The paragraph on page 13, lines 8-24 of the original specification has been amended. Note that (a) at line 15, "Fig. 3" has been changed to - - Fig. 4 - - to correct a typographical error. Lines 17-24 of page 13 have also been amended to correct the Specification so that it is consistent with Fig. 4 as filed. In particular, (b) at page 13, line 19, "... 65-degrees Fahrenheit in a first set of tubes" is replaced with - - ... 65-degrees

Fahrenheit and serves as a first set of tubes - -; (c) at page 13, line 20, "... fluid 148 traveling in the first set of tubes is interfaced in the tubular coil arrangement 216 with the contaminated gas phase 206 traveling in a second set of tubes." is replaced with - - ... fluid 148 travels in the first set of tubes which is represented by the tubular coil arrangement 216 while the contaminated gas phase 206 travels in a second tube which is represented by the chiller dryer condenser 214 in Fig. 4. - -; (d) at page 13, lines 22-23, "The contaminated gas phase 206 traveling in the second set of tubes of the tubular coil arrangement 216" is replaced with - - The contaminated gas phase 206 traveling in the second tube ... - -. The "Replacement Paragraph" is recited in the enclosed Section entitled In The Specification appearing on pages 2 and 3 of this Amendment "A".

In support of these amendments, Fig. 4 shows a tubular coil arrangement 216 which comprises a first set of tubes for carrying a filtered contaminated fluid 148 into a contaminant condenser module 204 from a micron filtration bank module 178. Fig. 4 also shows a contaminated gas phase 206 being transported by an environmental carrier air 218 from a vacuum pump 220 to the contaminant condenser module 204. The carrier air 218 transports the contaminated gas phase 206 across the tubular coil arrangement 216 carrying the cooler contaminated fluid 148 for condensing the contaminated gas phase 206. (See page 12, line 31 to page 13, line 6 of the Specification as filed.) As the contaminated gas phase 206 and atmospheric carrier air 218 pass across the tubular coil arrangement 216 within the chiller dryer condenser 214, the contaminated gas phase 206 is condensed into a contaminated liquid 234 and subsequently drained into a contaminated liquid storage tank 236 via a normally-open ball valve 238 as shown in Fig. 4. The condensing of the contaminated gas phase 206 into the contaminated liquid 234 is a second change of phase of the MTBE and VOC contaminants. (See page 14, lines 11-24 of the Specification, as amended.)

4. The paragraph on page 14, lines 11-24 of the original Specification has been amended. Lines 11-12 of page 14 have been amended to recite that the contaminated gas phase 206 and the atmospheric carrier air 218 pass across the tubular coil arrangement 216 within the chiller dryer condenser 214 as is clearly shown in Fig. 4. This amendment ensures that this paragraph at page 14, lines 11-24 is consistent with the paragraph appearing on page 13, lines 8-24, as amended. The "Replacement Paragraph"

is recited in the enclosed Section entitled In The Specification appearing on page 3 of this Amendment "A".

5. The paragraph on page 20, line 21 to page 21, line 4 of the original Specification has been amended. Line 2 of page 21 has been amended to correct a typographical error by changing the word "isolated" to - - isolate - -. After the amendment, the partial line 2 reads - -... second centrifugal pump 340 to isolate the discharge side of the pump 340 ... - -. The "Replacement Paragraph" is recited in the enclosed Section entitled In The Specification appearing on pages 3 and 4 of this Amendment "A".

6. The paragraph on page 22, line 27 to page 23, line 6 of the original Specification has been amended. Line 33 of page 22 and line 1 of page 23 have each been amended to recite that the contaminated gas phase 206 passes across the tubular coil arrangement 216 within the chiller dryer condenser 214 as is clearly shown in Fig. 4. This amendment ensures that this paragraph at page 22, line 27 to page 23, line 6 is consistent with the paragraph appearing on page 13, lines 8-24, as amended. The "Replacement Paragraph" is recited in the enclosed Section entitled In The Specification appearing on page 4 of this Amendment "A".

7. It is believed that these "Replacement Paragraphs" appropriately correct the specified informalities in the Specification. The Examiner is respectfully requested to withdraw his objections to the Specification in view of these amendments.

8. The Examiner is respectfully requested to amend the specification as set forth herein.

D. Invention as Presently Claimed is Patentable

Applicant's invention is directed to a multi-phase separation system 100 typically utilized to remove the chemical additives Methyl Tertiary-Butyl Ether (MTBE) and Volatile Organic Compounds (VOC's) from fluids such as groundwater. The present invention can be used to decontaminate groundwater after spillage or leakage of processed gasoline containing Methyl Tertiary-Butyl Ether (MTBE) from fuel storage tanks and Volatile Organic Compounds (VOC's) also utilized in gasoline and in various industrial environments such as in the steel industry. The multi-phase separation system100 is designed to receive contaminated fluid such as ground water and to discharge fluid meeting the water quality

requirements of the Environmental Protection Agency (EPA) and suitable for human consumption and usage. In a preferred embodiment, a pre-filtering and pre-separating module 120 receives contaminated groundwater, separates contaminates not in solution, and filters out and collects oils and greases on a polypropylene screen. A primary flow control module 150 includes a surge tank 152 having a level control system 154 employed to control a centrifugal pump 156 which regulates the liquid flow throughout the entire system 100. A micron filtration bank module 178 is employed for filtering out particles larger than 5-microns for eliminating sediment. A contaminant condenser module 204 utilizes the cooler filtered fluid 148 from the micron filtration bank module 178 as a cooling medium to condense the contaminated gas phase 206 emitted from a phase reaction chamber 166. A media temperature equalization module 274 functions to equalize the temperature of the contaminated fluid 148 from the contaminate condenser module 204 with a source of carrier atmospheric air 218 prior to entering the phase reaction chamber 166 for minimizing the probability of collateral reactions occurring within the phase reaction chamber 166. The phase reaction module 310 is employed to convert the contaminated fluid 148 to an atomized mist 316 which is subjected to a high vacuum-low vapor pressure environment for providing a first change of phase in a phase separation process causing the contaminated fluid 148 to separate into the contaminated gas phase 206 (MTBE & VOC's) and a liquid mist phase 324 as a result of exposure to high vacuum and temperature of the media. The fluid mist component gravity drains downward to a vacuum liquid discharge tank 288 while the contaminated gas phase 206 is carried upward via a carrier air 218 drawn by the vacuum through the phase reaction chamber 166, a mist eliminator 318, valves and controllers. A vacuum pump module 370 comprises a liquid sealed vacuum pump 220 for drawing the vacuum in the phase reaction chamber 166 for carrying the contaminated gas phase 206 to the contaminant condenser module 204 for capturing and condensing the contaminated gas phase 206 to a contaminated liquid 234, and temporarily storing the contaminated liquid 234. A liquid discharge monitoring module 390 is employed for constantly monitoring, sampling and analyzing a discharge liquid 392 from the vacuum liquid discharge tank 288 of the phase reaction module 310.

This advantageous design is defined in the present Specification and set forth in claims of varying scope, for example Claim 1 recites:

> 1. A multi-phase separation system for use in removing contaminants from fluids comprising:
> a pre-filtering module for receiving and filtering a contaminated fluid to provide a filtered contaminated fluid;
> a condenser module for receiving said filtered contaminated fluid and a contaminated gas phase for condensing of said contaminated gas phase to a contaminated liquid;
> a phase reaction module comprising a phase reaction chamber for converting said filtered contaminated fluid to a contaminated mist, said mist subjected to a low energy, high vacuum environment for providing a first change of phase by separating into said contaminated gas phase and a liquid mist phase, said contaminated gas phase being carried out of said phase reaction chamber by a carrier air; and
> a vacuum pump for providing said low energy, high vacuum environment in said phase reaction chamber and for delivering said contaminated gas phase to said condenser module to provide a second change of phase by said condensing. (Emphasis added.)

E. Argument

1. Indefiniteness - 35 U.S.C. Sec. 112, 2nd Paragraph

a. Claims 1-24 were rejected under 35 U.S.C. Sec. 112, 2nd paragraph by the Examiner as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

b. The Examiner argued that in Claims 1, 14 and 22, the limitation of a "low energy, high vacuum environment" is vague and indefinite. Further, the Examiner argued that the phrase "said carrier air exiting from said condenser module" in Claim 7, and the phrases "second carbon stage polisher" and "said liquid discharge monitoring module" in Claim 20 each lack a clear antecedent basis. Finally, the Examiner argued that Claim 13 is considered incomplete because it is essential to the instant system

that the micron filtration bank module receive filtered contaminated fluid from said pre-filtering module to block or filter particles from said filtered contaminated fluid.

c. The Examiner then concluded that Claims 1, 14 and 22 were vague and indefinite because it was unclear how the term "low energy, high vacuum environment" further limits the claims. Additionally, the Examiner concluded that Claims 7 and 20 are indefinite because of a lack of a clear antecedent basis, and that Claim 13 is incomplete for failing to make clear the connection between the micron filtration bank module and the pre-filtering module.

d. Applicant's independent Claims 1, 14 and 22 each recite the following novel feature which is not taught, disclosed or suggested in any of the cited references, either individually or in combination.

> A multi-phase separation system 100 for use in removing contaminants from fluids comprising ... a phase reaction module 310 comprising a phase reaction chamber 166 for converting said filtered contaminated fluid 148 to a contaminated mist 316, said mist 316 subjected to a low energy, high vacuum environment for providing a first change of phase by separating into said contaminated gas phase 206 and a liquid mist phase 324, said contaminated gas phase 206 being carried out of said phase reaction chamber 166 by a carrier air 218

e. Applicant's Recitation Further Limits Claims

(1) Applicant's pending independent Claims 1, 14 and 22 each recite that a multi-phase separation system 100 includes ... (1) a phase reaction module 310 comprising a phase reaction chamber 166, (2) for converting the filtered contaminated fluid 148 to a contaminated mist 316, (3) where the contaminated mist 316 is subjected to a low energy, high vacuum environment for providing a first change of phase, (4) by separating into the contaminated gas phase 206 and a liquid mist phase 324, and (5) the contaminated gas phase 206 is carried out of the phase reaction chamber 166 by a carrier air 218.

(2) A low energy environment equates to the amount by volume of both air molecules and contaminated gas molecules present in a vacuum environment required to cause phase separation of the contaminated gas to occur.

(3) In the prior art, air stripper units were employed to cause phase separation of the contaminants from water by the process of evaporation. In effect, this process requires an air blower system to blow atmospheric air across the contaminated water in a packed tower column. The dynamic is to cause evaporation of the contaminants from the liquid phase. This process requires large amounts of energy because large volumes of air molecules are being moved across a packed tower column.

(4) In the present invention, the atmospheric pressure within the phase reaction chamber 166 (shown in Applicant's Fig. 3) is reduced by removing air molecules by use of a vacuum pump 220 of the vacuum pump module 370 shown in Applicant's Fig. 4. This reduction in atmospheric pressure causes the contaminants introduced in an atomized liquid phase within the phase reaction chamber 166 to boil or flash into a gaseous state according to Henrys Law of Constants. (Please see Applicant's Specification at page 5, lines 5-7). At this stage, the contaminated fluid 148 within the phase reaction chamber 166 has been converted to a clean liquid (i.e., liquid mist phase 324) and the contaminants which are now in a gas phase (i.e., contaminated gas phase 206). (Please see Applicant's Specification at page 17, lines 6-11 and page 18, line 13 to page 19, line 1.)

(5) The process of the present invention described in Paragraph III.E.1.e.(4) immediately above which enables phase separation of the atomized contaminated fluid 148 into the contaminated gas phase 206 and the liquid mist phase 324 is much more efficient than the process disclosed in the prior art. This is the case since Applicant's invention consumes less energy than the air stripper process of the prior art and the fact that the phase reaction chamber 166 of the present invention operates at up to one full atmosphere. (Please see Applicant's Specification at page 13, lines 3-6, page 15, lines 29-31, and page 25, lines 22-23 and 25-27.)

(6) This explanation explains why the term "low energy, high vacuum environment" further limits Claims 1, 14 and 22 since it clearly distinguishes the structure of the present invention over the prior art. This is accomplished by demonstrating that phase separation of the contaminated fluid 148 occurs in Applicant's phase reaction chamber 166 in a more efficient manner with the least amount of energy being dissipated.

(7) Each of Applicant's independent Claims 1, 14 and 22 recites that the contaminated mist 316 is subjected to a low energy, high vacuum environment for providing a first change of phase by separating into the contaminated gas phase 206 and a liquid mist phase 324, the contaminated gas phase 206 being carried out of the phase reaction chamber 166 by a carrier air 218.

(8) Based upon the above arguments, the term "low energy, high vacuum environment" appearing in Applicant's pending independent Claims 1, 14 and 22 is not vague and indefinite because Applicant's Specification as filed clearly defines how this term further limits the claims.

(9) Therefore, the Examiner is respectfully requested to withdraw the rejection under 35 U.S.C. Sec. §112, 2nd paragraph, as applied to Applicant's pending independent Claims 1, 14 and 22 and Claims 2-6, 8-12, 15-19, 21, 23 and 24 which depend therefrom.

f. Lack of Antecedent Basis and Incomplete Claim

(1) The Examiner has rejected Applicant's pending Claims 7 and 20 based upon lack of clear antecedent basis.

(2) In Claim 7, the Examiner has pointed to the phrase "said carrier air exiting from said condenser module" as lacking a clear antecedent basis.

(a) Claim 7 has been amended to recite "The multi-phase separation system of Claim 1 further comprising a first carbon stage polisher for filtering said carrier air exiting from a chiller dryer condenser of said condenser module."

(b) The word - - further - - was added to make clear that "a first carbon stage polisher" was a new component of structure being recited.

(c) The term "said carrier air" has a clear antecedent basis in Claim 1, line 12 which recites "by a carrier air;".

(d) The additional limitation of - - a chiller dryer condenser - - assists in clarifying that the first carbon stage polisher filters the carrier air as the carrier air exits from the chiller dryer condenser of the condenser module.

(e) The component "condenser module" has a clear antecedent basis in Claim 1, line 5 which recites "a condenser module ...".

(3) In Claim 20, the Examiner has pointed to the phrases "second carbon stage polisher" and "said liquid discharge monitoring module" as lacking clear antecedent basis.

(a) Claim 20 has been amended to recite "The multi-phase separation system of Claim 14 further comprising a second carbon stage polisher for filtering a discharge liquid exiting from a liquid discharge monitoring module."

(b) The word - - further - - was added to make clear that "a second carbon stage polisher" was a new component of structure being recited.

(c) The term "second carbon stage polisher" has a clear antecedent basis in Applicant's pending Claim 20, lines 1-2 which recites "a second carbon stage polisher".

(d) The term "said discharge liquid" has been amended in Applicant's pending Claim 20, line 2 to recite - - a discharge liquid - -.

(e) The term "said liquid discharge monitoring module" has been amended in Applicant's pending Claim 20, lines 2-3 to recite - - a liquid discharge monitoring module - -.

(4) In Claim 13, the Examiner has determined the claim to be incomplete because the Examiner considers it essential to the instant system that the micron filtration bank module receive the filtered contaminated fluid from the pre-filtering module to block or filter particles from the filtered contaminated fluid.

(a) Claim 13 has been amended to recite "The multi-phase separation system of Claim 1 further comprising a micron filtration bank module for receiving said filtered contaminated fluid from said pre-filtering module for blocking particles greater than five microns in diameter.

(b) The word - - further - - was added to make clear that "a micron filtration bank module" was a new component of structure being recited.

(c) The newly added portion reciting - - for receiving said filtered contaminated fluid from said pre-filtering module - - satisfies the Examiner's essential requirement as set forth at the end of paragraph 2 on page 2 of the pending Office Action mailed on December 15, 2004. Further, the newly added portion has a clear antecedent basis in Claim 1, lines 3-4 which recites "a pre-filtering module for receiving and filtering a contaminated fluid to provide a filtered contaminated fluid".

(5) In view of the above amendments to Applicant's pending amended Claims 7 and 20 to provide clear antecedent basis, and to complete the recitation in Applicant's amended Claim 13, the Examiner is respectfully requested to withdraw his rejections of pending amended Claims 7, 13 and 20.

(6) Therefore, the Examiner is respectfully requested to withdraw the rejection under 35 U.S.C. Sec. §112, 2nd paragraph, as applied to Applicant's pending amended Claims 7, 13 and 20.

IV. CONCLUSION:

1. In light of the above analysis, the cited references neither individually under 35 U.S.C. §102 nor in combination under 35 U.S.C. §103(a) teach, disclose or suggest the invention as recited in Applicant's amended pending Claims. The amended pending Claims are set forth in a marked-up version herein, as required by 37 C.F.R. Sec. 1.121 effective as of July 30, 2003. Thus, pending independent Claims 1, 14 and 22 and the claims dependent therefrom, i.e., Claims 2-13, 15-21 and 23-24 which include amended Claims 7, 13 and 20 should be allowed and such action is earnestly solicited.

2. The prior art made of record has been thoroughly reviewed and has not been found to anticipate or make obvious the pending amended Claims.

3. The Examiner is invited and encouraged to initiate a telephone conference with Applicant's attorney at the telephone number listed below if the Examiner believes that such a conference would expedite allowance of the pending claims. Telephone calls may be directed to John S. Christopher at (213) 580-7963.

Respectfully submitted,
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